

## Chapter 4

# Assessing Risk

### Introduction

Assessment of risk is an important component of good risk management, but before a pilot can begin to assess risk, he or she must first perceive the hazard and attendant risk(s). In aviation, experience, training, and education help a pilot learn how to spot hazards quickly and accurately. Once a hazard is identified, determining the probability and severity of an accident (level of risk associated with it) becomes the next step. For example, the hazard of a nick in the propeller poses a risk only if the airplane is flown. If the damaged prop is exposed to the constant vibration of normal engine operation, there is a high risk that it could fracture and cause catastrophic damage to the engine and/or airframe and the passengers.

Risk Assessment Matrix				
Likelihood	Severity			
	Catastrophic	Critical	Marginal	Negligible
	High	High	Serious	
	High	Serious		
	Serious	Medium		Low
Probable				
Occasional				
Remote				
Improbable				

**RISK ASSESSMENT**

Pilot's Name: \_\_\_\_\_ Flight From: \_\_\_\_\_ To: \_\_\_\_\_

**SLEEP**

1. Did not sleep well or less than 5 hours \_\_\_\_\_ 2  
2. Slept well \_\_\_\_\_ 0

**HOW DO YOU FEEL?**

1. Have a cold or ill \_\_\_\_\_ 4  
2. Feel great \_\_\_\_\_ 0  
3. Feel a bit off \_\_\_\_\_ 2

**IS THE FLIGHT**

1. Day? \_\_\_\_\_ 1  
2. Night? \_\_\_\_\_ 0

**WEATHER AT TERMINATION**

1. Greater than 5 miles visibility and 3,000 feet ceilings \_\_\_\_\_ 1  
2. At least 3 miles visibility and 1,000 feet ceilings, but less than 3,000 feet ceilings and 5 miles visibility \_\_\_\_\_ 3  
3. IMC conditions \_\_\_\_\_ 4

**PLANNING**

1. Rush to get off ground? \_\_\_\_\_ 2  
2. No hurry \_\_\_\_\_ 1  
3. Used charts and computer to assist \_\_\_\_\_ Yes \_\_\_\_\_ 1  
4. Used computer program for all planning \_\_\_\_\_ Yes \_\_\_\_\_ 1  
5. Did you verify weight and balance? \_\_\_\_\_ Yes \_\_\_\_\_ 1  
6. Did you evaluate performance? \_\_\_\_\_ Yes \_\_\_\_\_ 1  
7. Do you brief your passengers on the ground and in flight? \_\_\_\_\_ Yes \_\_\_\_\_ 1

Column total \_\_\_\_\_

LEFT COLUMN TOTAL \_\_\_\_\_

**Risk Level Scale:**

0 **Not Complex Flight** 10 **Exercise Caution** 20 **Area of Concern** 30 **Endangerment**

**Low Risk** **Endangerment**

Every flight has hazards and some level of risk associated with it. Pilots must recognize hazards to understand the risk they present. Knowing that risk is dynamic, one must look at the cumulative effect of multiple hazards facing us. It is critical that pilots are able to:

- Differentiate, in advance, between a low-risk flight and a high-risk flight.
- Establish a review process and develop risk mitigation strategies to address flights throughout that range.

For the pilot who is part of a flight crew, input from various responsible individuals cancels out any personal bias or skewed judgment during preflight planning and the discussion of weather parameters. The single pilot does not have the advantage of this oversight. If the single pilot does not comprehend or perceive the risk, he or she will make no attempt to mitigate it. The single pilot who has no other crewmember for consultation must be aware of hazardous conditions that can lead to an accident. Therefore, he or she has a greater vulnerability than a pilot with a full crew.

Assessing risk is not always easy, especially when it involves personal quality control. For example, if a pilot who has been awake for 16 hours and logged over 8 hours of flight time is asked to continue flying, he or she will generally agree to continue flying. Pilots often discount the fatigue factor because they are goal oriented and tend to deny personal limitations when asked to accept a flight. This tendency is exemplified by pilots of helicopter emergency medical services (EMS) who, more than other pilot groups, may make flight decisions based upon the patient's welfare rather than the pilot's personal limitations. These pilots weigh intangible factors such as the patient's condition and fail to quantify actual hazards appropriately, such as fatigue or weather, when making flight decisions.

Examining National Transportation Safety Board (NTSB) reports and other accident research can help a pilot learn to assess risk more effectively. For example, the accident rate during night visual flight rules (VFR) decreases by nearly 50 percent once a pilot obtains 100 hours, and continues to decrease until the 1,000 hour level. The data suggest that for the first 500 hours, pilots flying VFR at night might want to establish higher personal limitations than are required by the regulation and, if applicable, become better skilled at flying under instrument conditions.

Several risk assessment models are available to assist the pilot in determining his or her risk before departing on a flight. The models, all taking slightly different approaches, seek the common goal of assessing risk in an objective manner.

## Quantifying Risk Using a Risk Matrix

The most basic tool is the risk matrix. [Figure 4-1] It assesses two items: the likelihood of an event occurring and the consequence of that event.

Risk Assessment Matrix				
Likelihood	Severity			
	Catastrophic	Critical	Marginal	Negligible
Probable	High	High	Serious	
Occasional	High	Serious		
Remote	Serious	Medium		Low
Improbable				

**Figure 4-1.** A sample risk assessment matrix a pilot can use to differentiate between low-risk and high-risk flights.

### Likelihood of an Event

Likelihood is nothing more than taking a situation and determining the probability of its occurrence. It is rated as probable, occasional, remote, or improbable. For example, a pilot is flying from point A to point B (50 miles) in marginal visual flight rules (MVFR) conditions. The likelihood of encountering potential instrument meteorological conditions (IMC) is the first question the pilot needs to answer. The experiences of other pilots coupled with the forecast might cause the pilot to assign "occasional" to determine the probability of encountering IMC.

The following are guidelines for making assignments.

- Probable—an event will occur several times.
- Occasional—an event will probably occur sometime.
- Remote—an event is unlikely to occur, but is possible.
- Improbable—an event is highly unlikely to occur.

### Severity of an Event

The other item in the matrix is the severity or consequence of a pilot's action(s). It can relate to injury and/or damage. If the individual in the example above is not an instrument flight rules (IFR) pilot, what are the consequences of encountering inadvertent IMC conditions? In this case, because the pilot is not IFR rated, the consequences are potentially catastrophic. The following are guidelines for this assignment.

- Catastrophic—results in fatalities, total loss
- Critical—severe injury, major damage
- Marginal—minor injury, minor damage
- Negligible—less than minor injury, less than minor system damage

Simply connecting the two factors as shown in *Figure 4-1* indicates the risk is high and the pilot must not fly, or fly only after finding ways to mitigate, eliminate, or control the risk.

Although the matrix in *Figure 4-1* provides a general viewpoint of a generic situation, a more comprehensive

program can be made that is tailored to a pilot's flying. [Figure 4-2] This program includes a wide array of aviation related activities specific to the pilot and assesses health, fatigue, weather, capabilities, etc. The scores are added and the overall score falls into various ranges, with the range representative of actions that a pilot imposes upon himself or herself.

RISK ASSESSMENT	
Pilot's Name <input type="text"/>	Flight From <input type="text"/> To <input type="text"/>
<b>SLEEP</b> 1. Did not sleep well or less than 8 hours <input type="radio"/> 2 2. Slept well <input type="radio"/> 0	<b>HOW IS THE DAY GOING?</b> 1. Seems like one thing after another (late, making errors, out of step) <input type="radio"/> 3 2. Great day <input type="radio"/> 0
<b>HOW DO YOU FEEL?</b> 1. Have a cold or ill <input type="radio"/> 4 2. Feel great <input type="radio"/> 0 3. Feel a bit off <input type="radio"/> 2	<b>IS THE FLIGHT</b> 1. Day? <input type="radio"/> 1 2. Night? <input type="radio"/> 3
<b>WEATHER AT TERMINATION</b> 1. Greater than 5 miles visibility and 3,000 feet ceilings <input type="radio"/> 1 2. At least 3 miles visibility and 1,000 feet ceilings, but less than 3,000 feet ceilings and 5 miles visibility <input type="radio"/> 3 3. IMC conditions <input type="radio"/> 4	<b>PLANNING</b> 1. Rush to get off ground <input type="radio"/> 3 2. No hurry <input type="radio"/> 1 3. Used charts and computer to assist <input type="radio"/> 0 4. Used computer program for all planning Yes <input type="radio"/> 3 No <input type="radio"/> 0 5. Did you verify weight and balance? Yes <input type="radio"/> 0 No <input type="radio"/> 3 6. Did you evaluate performance? Yes <input type="radio"/> 0 No <input type="radio"/> 3 7. Do you brief your passengers on the ground and in flight? Yes <input type="radio"/> 0 No <input type="radio"/> 2
Column total <input type="radio"/>	Column total <input type="radio"/>
LEFT COLUMN TOTAL <input type="radio"/> + RIGHT COLUMN TOTAL <input type="radio"/> = TOTAL SCORE <input type="text"/>	

Figure 4-2. Example of a more comprehensive risk assessment program.

## Mitigating Risk

Risk assessment is only part of the equation. After determining the level of risk, the pilot needs to mitigate the risk. For example, the VFR pilot flying from point A to point B (50 miles) in marginal flight conditions has several ways to reduce risk:

- Wait for the weather to improve to good VFR conditions.
- Take a pilot who is more experienced or who is certified as an instrument flight rules (IFR) pilot.
- Delay the flight.
- Cancel the flight.
- Drive.

## Chapter Summary

The pilot can assess risk by using risk assessment models that quantify the risk by assessing the likelihood of an event occurring and the consequences of that event.

Go to [www.FAA.gov](http://www.FAA.gov) for a downloadable risk assessment program to use.